

77AESW/EEV Emerging Technologies and P2 Efforts

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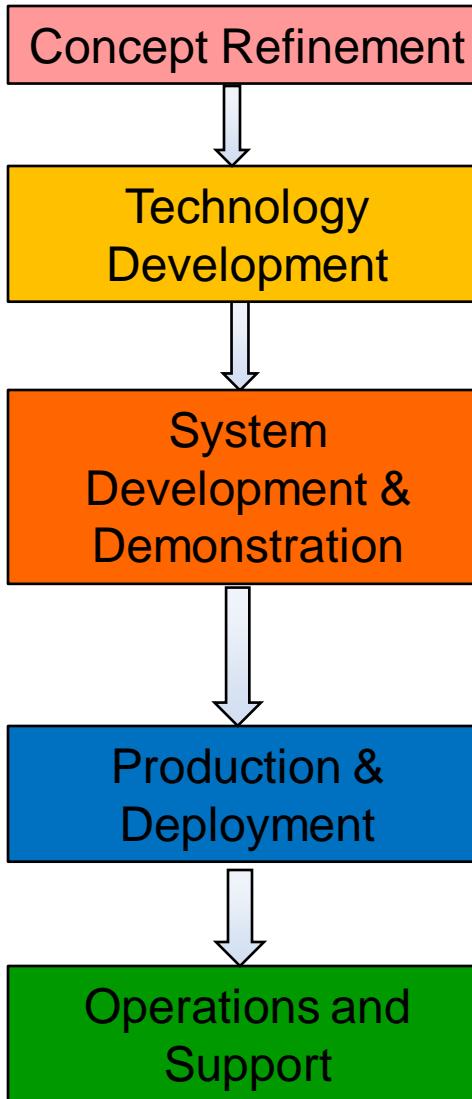
Project Team

- COTR – Tom Lorman
- Project Manager – Jim Tankersley
- Task Leader – John Stropki
- Project Support Staff
 - Annie Lane (Researcher)
 - Eric Griesenbrock (Researcher)
 - Vinay Gadkari (SME – Technology Insertion)
- Additional Stakeholders
 - AFMC
 - AFRL
 - AFP 4, AFP 6

Life Cycle Cost Analysis



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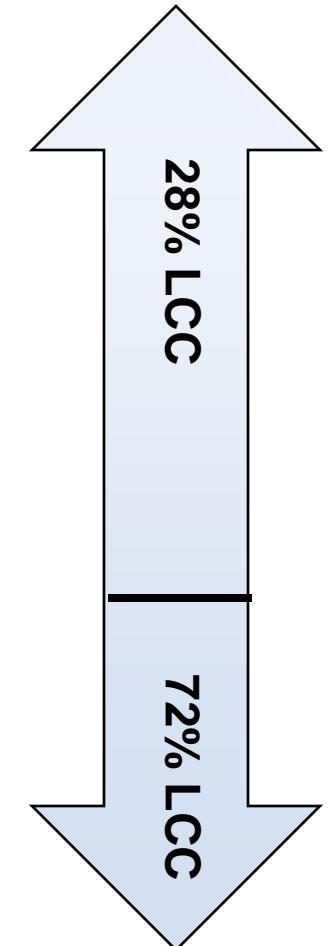


High ability to influence LCC (70-75% of cost decisions made)

Less ability to influence LCC (85% of cost decisions made)

Little ability to influence LCC (90-95% of cost decisions made)

Minimum ability to influence LCC (95% of cost decisions made)



77AESW/EEV Pollution Prevention Program

- Partnership with 77AESW/EEV (ASC/ENVV) since 2002
- Work with Wings to develop engineering, technology, and process needs
- Identify applicable technologies through Battelle, academia, national labs, industry, DoD, etc.
- Rank and prioritize to present findings for consideration

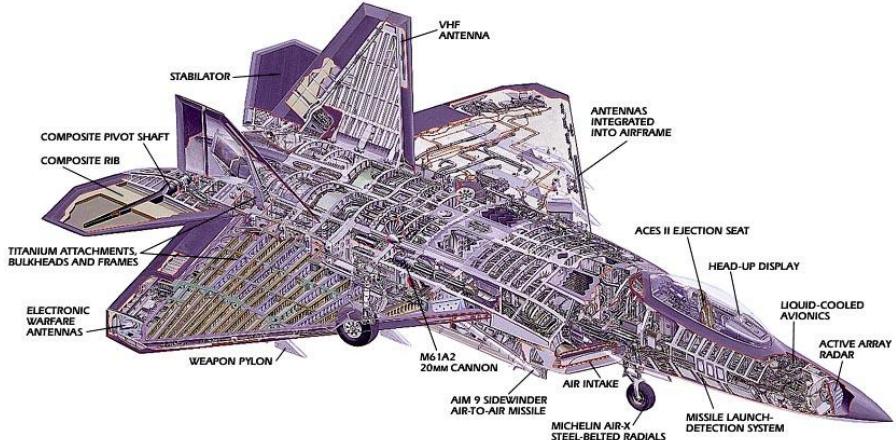


Project Summary

ASC Pollution Prevention Technology Integration



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Program Approach:

- Identify, quantify, & finalize requirements (needs)
- Conduct research into relevant technologies
- Identify relevant technology applications
- Present results to 77AESW for programming and investment

Scope:

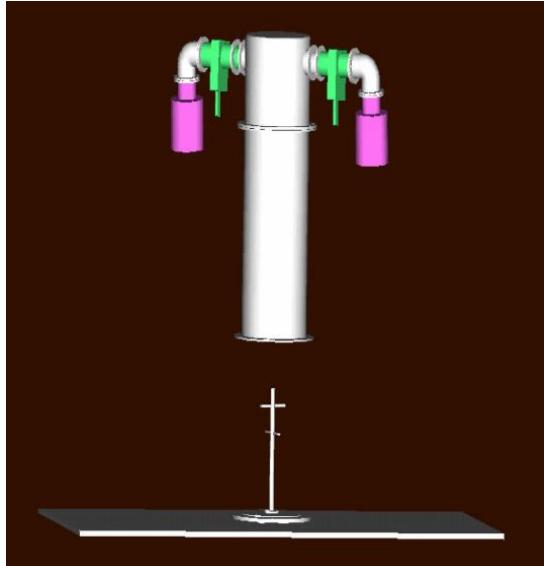
- Conduct weapon system P2 needs collection for System Program Offices and GOCOs
- Identify/recommend material investments for ASC weapon system platforms that reduce pollution footprint, based on needs collected

Results:

- Extensive meetings/discussions with personnel to develop engineering requirements (SPO, OEMs, Air Depots)
- Draft list of engineering requirements
- Seeking approval from DOEs (Need Verification Letters)
- Rank and package technology options for solutions



Project Summary – *Small Parts Aluminum Coater (S-PAC)*



Scope

- Conduct a feasibility study to determine and recommend a practical operational design for an environmentally friendly, cost-effective coating system that is reliable for applying a uniform and dense protective aluminum coating to interior and exterior surfaces on steel aircraft landing gear components with small interior diameters
- Follow On (FY11) Project to optimize and demonstrate prototype system

Program Approach

- The 12" inner diameter S-PAC prototype system will be able to demonstrate coatings on adhesion test specimens, corrosion test panels, embrittlement bars, and small production-type parts.

Results

- Proof of concept (replace Cd in production environment)
- Has the potential to reduce and/or eliminate cadmium coatings on the production line to reduce the economic and environmental burdens associated with using a known EPA-17 hazardous material.

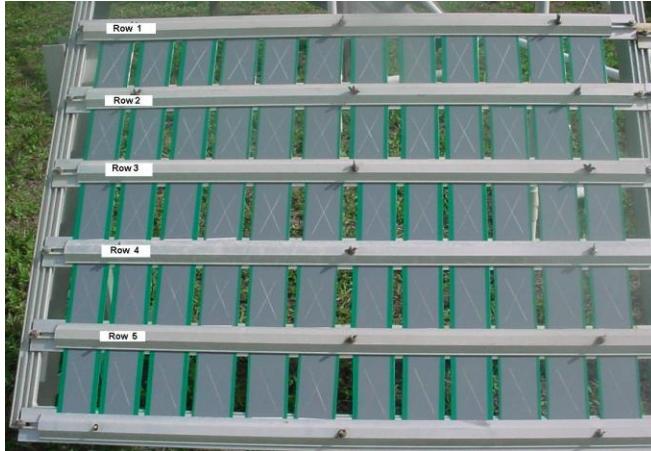


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Project Summary

Mg Rich Primer Manufacturing Compatibility Study

Test
Panels at
FMRF



Program Approach:

- Participation in “round robin” testing of magnesium rich primer in sample coating stack-ups (w/NASA, AFRL, ANAC)
- Coupons provided by AFRL/CTIO
- Exposure testing on static A/C located at Florida ANG
- Exposure testing on coupons at FMRF, Daytona Beach, FL

Scope:

- Validate an environmentally friendly coating system through coupon tests and outdoor exposure tests on select non-chromate coating system stack-ups for use on F-22 and F-35 aircraft.

Results:

- Anticipated results include validation of magnesium rich primer as possible replacement for chromium containing primer
- Three and six month data collected show Mg Rich primer to be performing well in comparison with chromated coatings.

Project Summary – *Environmentally Advantaged RAM Coating (EARC)*



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ESTCP WP-0303



Program Approach:

- Reduce environmental burdens by qualifying coatings with lower VOC, exempt solvents
- Qualify/demonstrate improved curing agents and reduced cure times through high vapor pressure applications
- Utilizes improved polyurethane resin and admixed applications

Scope:

- Dem/Val low volatile organic compound (VOC), quick-curing aerospace coatings for multiple weapon systems
- Two quick-cure coatings – FP212 & FP 60-2 evaluated for different weapon systems

Results:

- All laboratory scale tests passed
- Successful applications on full-scale engineering prototypes
- Quicker cure times
- Improved durability of coatings



Project Summary – *Hydraulic Fluid Purification (HFP)*



Program Approach:

- Test and Validate approved process to purify hydraulic fluid at AFRL trial
- Set up field trials as various locations
- Test hydraulic fluid samples before and after HFP
- Perform a CBA and Investigate users' pros and cons
- Develop plan to institutionalize HFP AF wide

Scope:

- Demonstrate/qualify hydraulic fluid purification process
- Incorporate approved process into AFI 21-101
- Purchase purifiers for unit acquisition

Results:

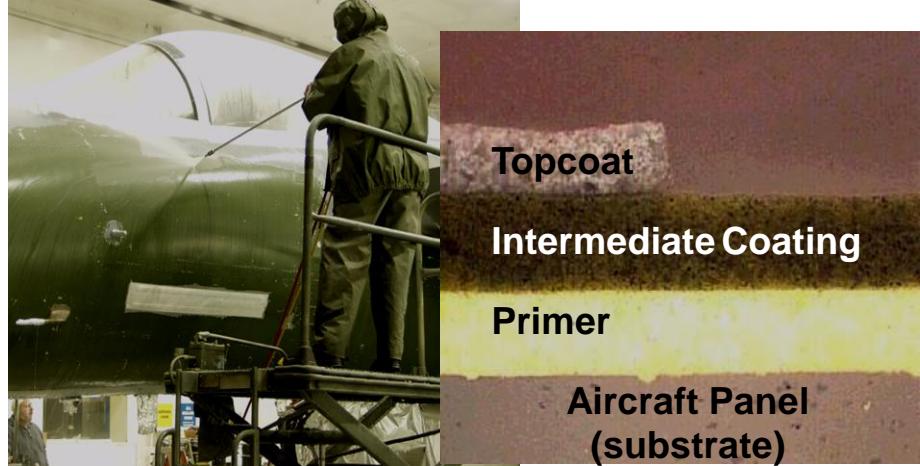
- Dramatically minimizes the amount of hydraulic fluid purchased and disposed
- Dramatically minimizes the transport to other theaters hydraulic fluid and return to US for disposal
- Increase MTBF of hydraulic components
- In draft AFI 21-101 as an approved process AFSO21 initiative in work

Project Summary

Barrier Coat Compatibility Study



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Scope:

- Conduct a controlled field assessment of barrier coating and selective coating removal technology to validate reductions in economic and environmental burdens associated with protective primer and LO coatings used on OML of F-16, F-22, and F-35 aircraft

Program Approach:

- Work in concert with LM Aero to produce test panels and fly them on LM Aero assets
- Coordinate two separate site demonstrations of technology with 77 AESW, F-22, AFRL/CTIO and LM Aero representatives
- Cooperation with F-16, F-22, F-35 SPOs
- Application, flight testing, performance evaluation, and removal demonstration with Type VII bio-based media

Results:

- Confirmation needed that coating will not compromise RCS (radar cross section) signature of aircraft
- Data gathered from this project will be provided to F-16, F-22 and F-35 SPOs for application of coating to system stack-up
- Selective removal of LO coating components to eliminate full removal of hazardous materials

Project Summary

Fuel Cell Powered Tow Tug



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Program Approach:

- **Phase 1 Feasibility study - *Completed***
- **Phase 2 Integrated fuel cell and tow tug demonstration - *Completed***
- Phase 3 Integrated fuel cell and tow tug operations

Scope:

- Demonstrate the technological and economic viability of an alternative fuel cell powered solution for aircraft ground support operations

Results:

- Phase 1 and Phase 2 demonstrated the feasibility of a towbar-less fuel cell tow tug for F-16 aircraft
- **Phase 3 will provide for extended operations in operational environments (e.g., ANG Base and Robins AFB GA)**
- Investigate the fuel cell powered tow tug use, performance and maintenance requirements in the long term (up to a total of 24 months)
- Fueling scenarios will be investigated



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Additional 77 AESW/EEV Projects FY05 – FY08

- Low VOC Temporary Protective Coating (LM Aero)
- Alternative for Chromated Sealants (LM Aero)
- Sputtered Aluminum For WS Cert/Manufacturing at Hill AFB (Hill AFB/Boeing)
- Qualification of Cold Spray Coating Process (Boeing)
- Citric Acid Passivation Alternative (LM Aero)
- Non-Chrome Primer for C-130J IML (LM Aero)



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Upcoming Proposed Efforts

- Mixing Inline Spray Paint Phase II of II (**AFP 4**)
- Selective and Complete Removal of Low Observable and other Specialty Coatings: Laser Removal Process (**F-22**)
- Trivalent Chromate Pretreatment (**AFP 6**)
- Alternative Low VOC/HAP Aircraft Marking Inks (**AFP 6**)
- Inert Non-Ni Conductive Fillers, Phase I Material Demonstration (**F-35/AFRL**)
- Alkaline Cleaner (**AFP 4**)
- Anti-ice aircraft Coating (**SBIR**)
- Evaluation of Next Generation Mg-Rich Primers, Phase II (Flight Testing)
- Low Temperature Cure Powder Coating for Non-Flight Critical WS Components
- Low Gloss Powder Coatings (**SBIR**)
- Demonstration of Radiant Energy for Aircraft Deicing (**ESTCP**)
- Aircraft Ice Detection System
- Fate & Transport of Nanoparticles (**SG and SBIR**)
- Replacement for Cr Primer on F-22: Performance Evaluation of Deft 02-GN-093 MIL-PRF-23377J Type I Class N Primer
- Validation Assessment of an Alternative for Chromate Primer on OML of F-22: Ferrate Inhibitor Compounds (**Joint Source Funding: ESTCP and IR&D**)
- Corrosion Resistant Boot (**AFP 4**)
- Ultraviolet Curable Anti-Microbial Coatings for Aerospace Applications (**Hill AFB**)



Fund Sources

Program	Process Owner AFMC POC	Project Time Frame TRL	Policy/ Guidance	Funding Info
ACTD / JCTD - Advanced Concept/Joint Capabilities Technology Demonstrations	DUSD/(AS&C) HQ AF/XI HQ AFMC POC A5S	1-4 yrs Year round Call TRL >6 not 6.1 or 6.2	Ref: http://www.acq.osd.mil/actd/index.htm	PB~ \$160M/yr FY05 Projects ranged from \$400K to \$9.8M PEC 0603750D86
TTI – Technology Transition Initiative	OSD SAF/AQR HQ AFMC POC A5S	1-4 yrs Prefer < 2 yrs Feb Call Apr due TRL 6 or 7	Ref: http://www.acq.osd.mil/ott/tti/ Ref: PB Budget Sheet http://www.dtic.mil/descriptivesum/Y2007/OSD/0603826D8Z.pdf	PB ~\$30M/yr \$1M to \$3M per project Technology developed with S&T funding
QRF – Quick Reaction Funds	DUSD HQ AFMC POC A5S	6 to 12 mo > TRL 6	Ref: http://www.acq.osd.mil/qrsp/qrsp_background.html	PB ~\$25M/yr FY05 - 100 submitted with 12 funded. Anticipate 19 New Starts in FY07 PEC 0603826D8Z
R-TOC - Reduction of Total Ownership Costs	OUSD(AT&L) HQ AFMC POC A5S	< 3 Years	Ref: http://rtoc.ida.org/rtoc/rtoc.html	PB ~\$25M/yr



Fund Sources

Program	Process Owner AFMC POC	Project Time Frame TRL	Policy/ Guidance	Funding U.S. AIR FORCE Info
ATD – Advanced Technology Demonstration Program	SAF/AQ	TRL 4 to 6	Ref: AFMC 63-102, AFI61-101 & AFMCI 61-102 ATDs must be commissioned by an ATC and are programs containing an integrated set of technologies that may enable superior warfighting capabilities.	6.3 Funding. Costs may be typically between \$2M and \$100M.
CTMA - Commercial Technology for Maintenance Activities		2 to 3 years TRL 7	Ref: http://ctma.ncms.org/PlanSite/default.asp	~\$10M/yr 2 to 1 DoD/Industry matching funds
CPP – Capital Purchase Program	AFMC/A4BE		Ref: AFMCI 21-109	Must be planned 3 yrs in advance of need ➤\$250K Obligated in year programmed
Critical Experiment	PEO/TEO	1-2 years > TRL 3		



Fund Sources

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Program	Process Owner AFMC POC	Project Time Frame	Policy/ Guidance	Funding Info
DACP – Defense Acquisition Challenge Program	OSD/CTO Comparative Technology Office	<3 Years prefer 1 > TRL 8	Ref: https://cto.acqcenter.com/os/portal.nsf/Start?ReadForm	~\$29M PEC 0604051D8Z
DARPA -Defense Advanced Research Projects Agency	DoD DARPA		Ref: http://www.darpa.mil/index.html	~ \$1.5B for 6.1
Defense Logistics Agency Reliability Initiative	DLA DSC Richmond Sustainment Engineering Branch	> TRL 7	Parts must be DLA controlled Ref: http://www.dscr.dla.mil/vg/files/DSCR%20111505%20Reliability%20Briefing.ppt	~\$22M avail 21 AF projects funded in 05 for \$8.4M
ESTCP - Environmental Security Technology Certification Program	DUSD(S&T)	< 2 Years > TRL 7	Ref: http://www.estcp.org/	PB ~ \$35M/yr Max \$3M/yr or total of \$5M PEC 063851D8Z



Fund Sources

Program	Process Owner AFMC POC	Project Time Frame	Policy/ Guidance	Funding Info
PECI – FASCAP - Product Enhancing Capital Improvement Program & Fast Payback Capital Investment Program	HQ AFMC/FM	< 2 Years	Ref: AFI 38-301 AF From 2276	<\$200K/yr per project Must amortize in less than four (4) years
PECI – PIF - Product Enhancing Capital Improvement Program & Productivity Investment Fund	HQ AFMC/FM	< 2 Years	Ref: AFI 38-301 AF From 2276	<\$200K/yr per project Must amortize in less than four (4) years
Rapid Response Process (RRP)	SAF/AQXA	Capability must be fielded in time to impact an ongoing conflict or a crisis situation (nominally within 60 days of RRPC or CSAF approval).	Ref: AFI 63-114	
Rapid Response Program Initiative (R2PI)	AFRL/ML ManTech	< 18 Mo	Ref: http://www.ml.afrl.af.mil/mlm/r2pi.html	~\$6M /yr
RRF- Rapid Response Funds				PB ~ \$52M PEC – 0603826D8Z



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77AESW/EEV – Winner, Gen. Thomas D. White Environmental Excellence in Weapon System Acquisition Team Award - 2009





Acknowledgements

- **77AESW/ENVV**

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